

M&S Support to Joint Experimentation

~~From Today's Concepts to Tomorrow's~~



Annette C. Ratzenberger, J95
Simulating Tomorrow



J95 Mission Statement

Joint Experimentation



- **J95 will support the Joint Experimentation Program with model and simulation tools that:**

- ▴ **Are analytically accurate, flexible, responsive, and user-friendly.**
- ▴ **Are capable of reflecting future doctrine, organizations and materiel.**
- ▴ **Represent the synergies of Joint and coalition warfighting concepts.**



Rapid Decisive Ops

Joint Experimentation



- **RDO is the integrating concept that our efforts will focus around.**

- ▲ **Spiral 1 FY00 - Shaping the Battlespace.**
- ▲ **Spiral 2 FY01 - “Strike” Operations.**
- ▲ **Spiral 3 FY02 - Sustainment and Transition.**
- ▲ **Spiral 4 FY03 - Simulation of the Live event in FY04.**
- ▲ **Spiral 5 FY04 - Live Event with simulation support.**

- **Under the RDO concept the following concepts will be explored:**

- ▲ **Attack Ops Against Critical Mobile Targets (AOACMT)**
- ▲ **Adaptive, Joint C2**



Current Programs

Joint Experimentation



- **RDO Phase 1 - FY00 - Setting Conditions**
 - ▲ **LOE 001 Non-Kinetic Weapons - JCATS**
 - ▲ Urban AOACMT - TRANSIMS
 - ▲ Information Superiority & AOACMT - EADTB
 - ▲ RDO Options & Information Superiority - EBW
 - ▲ RAPID Deployment - JFAST
 - ▲ **Air, Sea Superiority, AO expanded tgt set - PEGASUS**
 - ▲ Test JWARS .
 - ▲ Aerospace M&S.
 - ▲ Preparation of JSAF(STOW) for 1st Qtr FY01.
 - ▲ Sensor Federate.
 - ▲ **Millennium Challenge 00**



Future Programs

Joint Experimentation



- RDO Phase 2 - FY01 - Strike Operations
 - ▲ JSAF/STOW Federation
 - ▲ JWARS Availability?? (back-up is Pegasus)
- Phase 3 - FY02 - Sustainment and Transition
 - ▲ M&S candidates are few.
- Phase 4 - FY03 - Virtual Field Test of the Concepts (CAWE?)
 - ▲ JSIMS Availability?? (Back-up is JTC)
 - ▲ JWARS Applicability??
- Phase 5 - FY04 - Live Integrating Event - Field test of the Concepts.
 - ▲ Supported by JSIMS ??.



GAO Report On Joint Experimentation

Joint Experimentation



“According to the DMSO, the Ability to Model or Simulate Important Warfighting Elements, Such As Command and Control, Operations Other Than War, Information Operations, Human/group Behavior Representation, Is Not Well Represented Or Within Dod’s Current Technological Capabilities. Capabilities May Not Be Fully Achieved for a Decade or More And Will Require Significant Basic Research Effort to Achieve An Acceptable Degree of Confidence in Their Utility.”

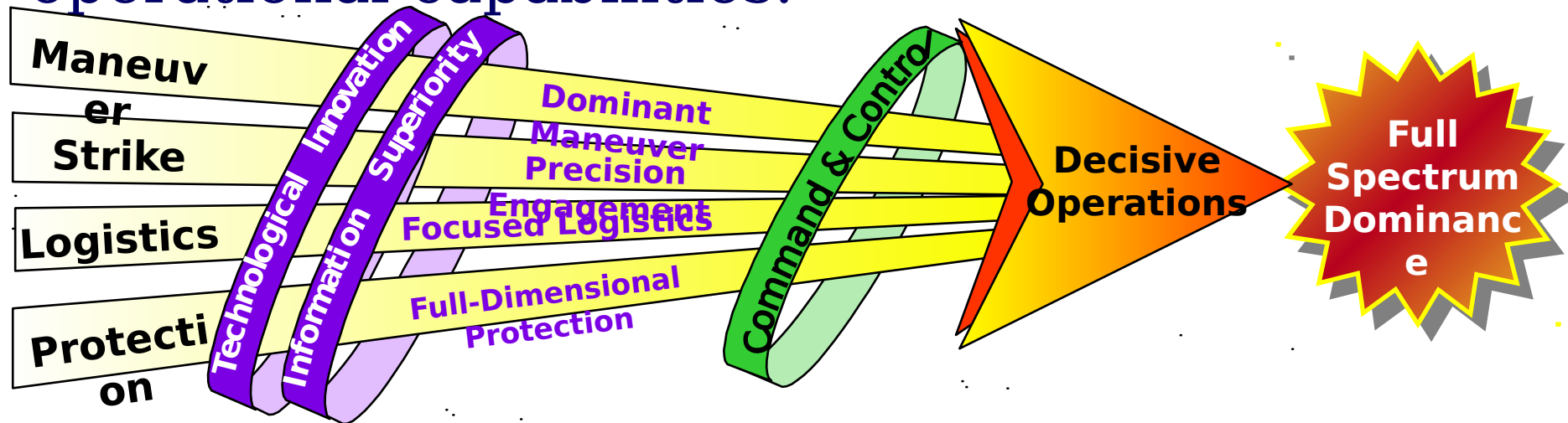
**GAO/MSIAD-99-64 Military Operations
March 1999**



Joint Experimentation

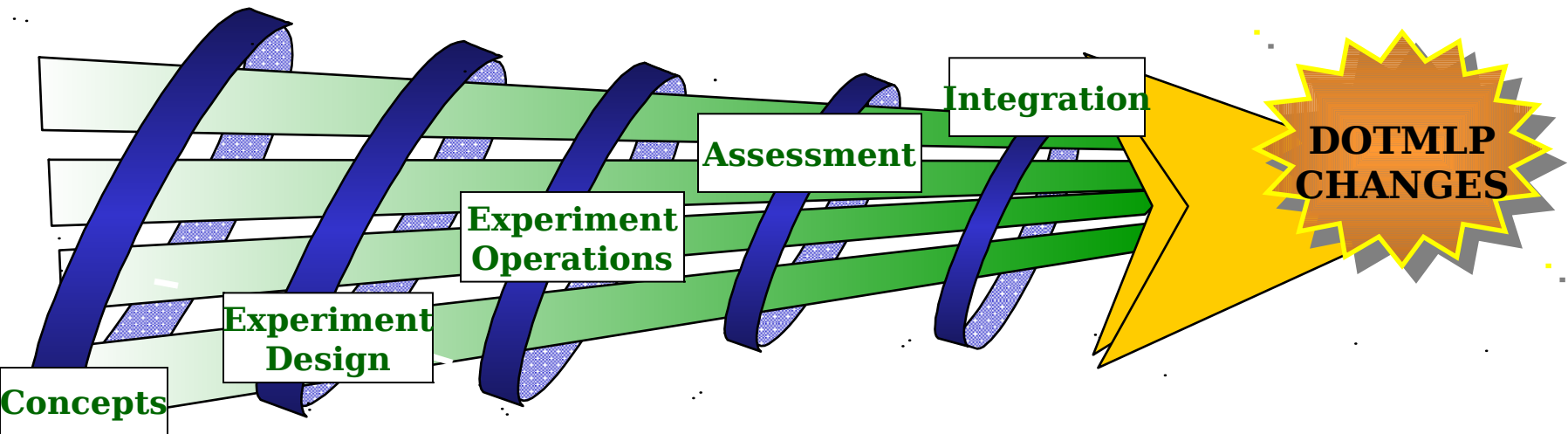
Definition

Joint Experimentation is an *iterative process* of collecting, developing and exploring *concepts* to identify and recommend the *better value-added solutions* for changes to DOTMLP required to achieve *significant advances* in future joint operational capabilities.





M&S Tools to Support Joint Experimentation



OPERATIONAL REQUIREMENTS

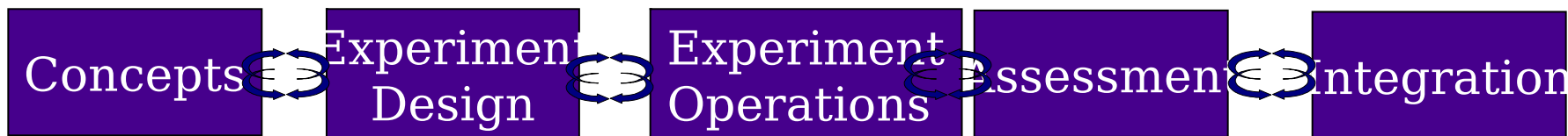
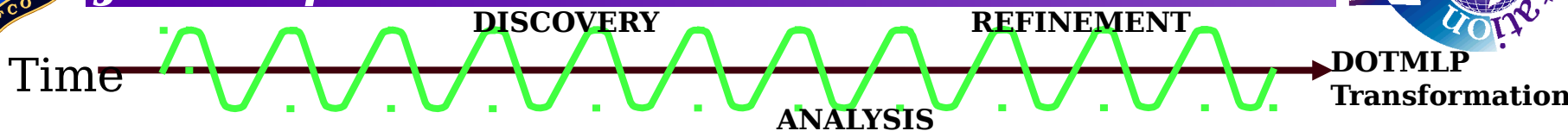
- **Doctrine** - “Jointness”.
- **Organization** - Flow of Information, Task Organization, JTF design.
- **Training** - Identifying Training deficiencies.
- **Materiel** - Non-linear Battlespace.
- **Leadership** - Simulation of Human Decision Making.
- **Personnel** - Simulation of Human Behaviors.



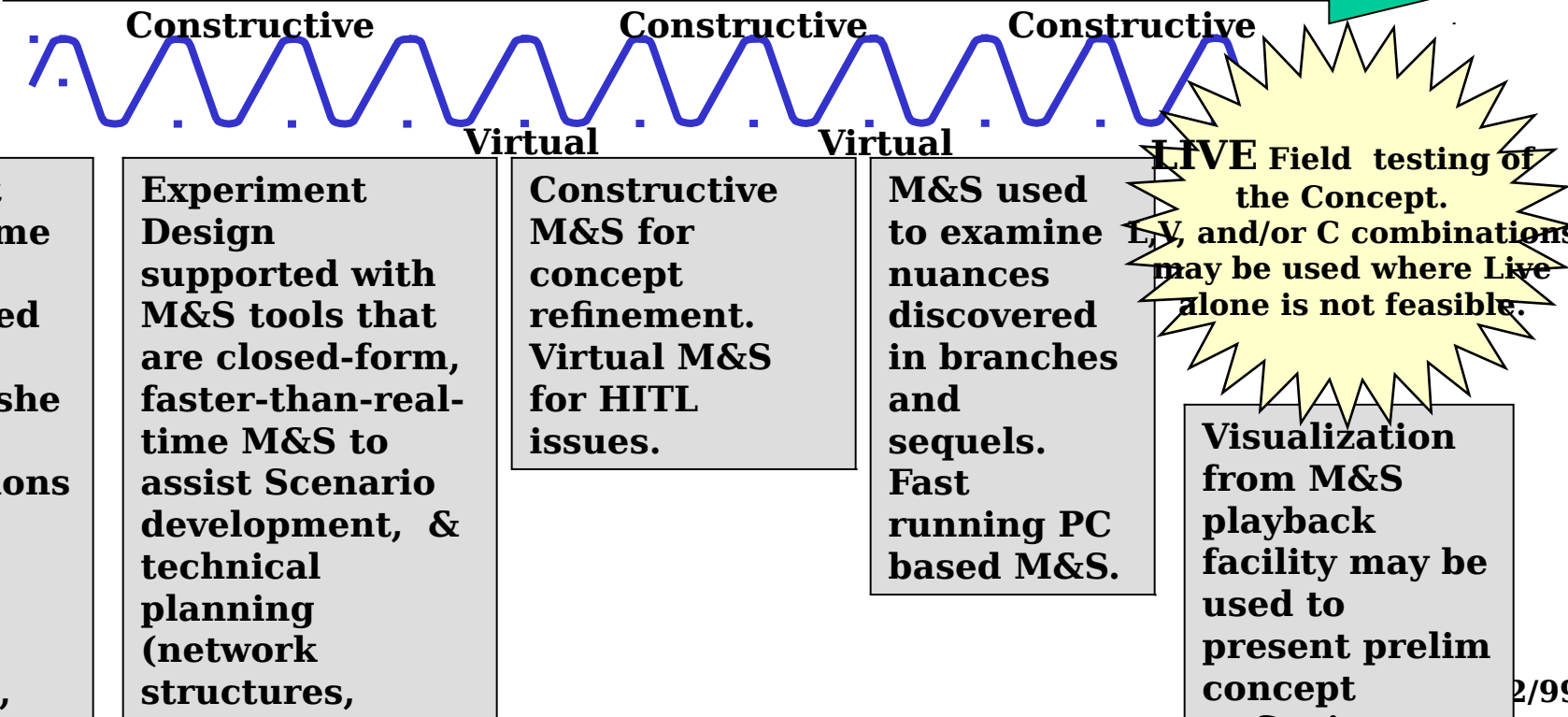
Tools to Support JE Process



Joint Experimentation



Increasing Scope & increasing Analytic Rigor



Concept development supported with "spreadsheet" type simulations, closed-form, fast running,

Experiment Design supported with M&S tools that are closed-form, faster-than-real-time M&S to assist Scenario development, & technical planning (network structures,

Constructive M&S for concept refinement. Virtual M&S for HITL issues.

M&S used to examine nuances discovered in branches and sequels. Fast running PC based M&S.

LIVE Field testing of the Concept. I, V, and/or C combinations may be used where Live alone is not feasible.

Visualization from M&S playback facility may be used to present prelim concept



Tools to Support JE Process

Joint Experimentation



TECHNICAL REQUIREMENTS

- **A Single Simulation Environment That Could Be Configured to Be:**
 - ▲ **Fast Running Constructive.**
 - ▲ **Real-time HITL, Virtual.**
 - ▲ ***Multi-resolution!!!.***
- **A Simulation Environment That Allows For:**
 - ▲ **Easy and Flexible Scenario Generation**
 - ▲ **Rapid, Numerous Changes to Parameters, Doctrine, Forces, Organization**
 - ▲ **Scenario Sharing Across the Resolutions.**
- **Analytic Rigor:**
 - ▲ **V&V Where Possible. An Environment in Which V&V Can Be Conducted**
 - ▲ **Data and Algorithm “Pedigrees.”**
 - ▲ **Service “Buy-in”.**
- **A Simulation Environment That Can Be Configured As**
 - ▲ **PC-based or an “Immersive” Environment.**
 - ▲ **Single Processor And/or Distributed.**
- **User Friendly and Meets DOD Standards.**

FLEXIBLE, FLEXIBLE, FLEXIBLE



Contact List

Joint Experimentation



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Joint Experimentation



BACKUP SLIDES



JFAST (Joint Flow and Analysis System for Transportation)

Joint Experimentation



- **USTRANSCOM-Owned, Proven, Operational Planning Tool for Multi-modal Transportation Analysis (Part of the Global Transportation Network (GTN)).**

STRENGTHS:

- **Runs on One NT Workstation; Can Also Be Distributed.**
- **Highly Graphic, User-friendly GUI With Extensive Reporting Module.**
- **Accepts and Outputs Standard JOPES TPFDD in B8 Format.**
- **FREE!**

LIMITATIONS:

- **Requires User to Pre-specify Transportation Mode for Each Deploying Element.**

APPLICATION:

- **Front-end Analysis Tool to Assist in Defining the “Rapid”**



EBW (Entropy Based Warfare)

Joint Experimentation



- A BAH product used to support wargaming efforts in the Army, Navy and the Office of net Assessment. EBW is different from legacy, attrition-based models.
- **STRENGTHS:** Represents the impact and/or value of information.
 - ▲ Information impacts the battle outcomes through Entropy, which measures levels of disorganization, dysfunction, and demoralization
 - ▲ Lack of information, or delivery of misinformation, increases entropy
 - ▲ Delivery of timely, accurate, high quality information decreases entropy
 - ▲ The model also accounts for the full range of conventional (air, ground, and naval combat) and unconventional (information operations and space warfare) military actions.
- **LIMITATIONS:** It was built from a board war-game and requires the “smart-guy” behind the curtain to make it function. Not verified and validated for analytical or experimentation uses. Limited availability of data.



JCATS

Joint Conflict And Tactical Simulation

Joint Experimentation



- USACOM owned, multi-service, multi-sided, interactive, entity-level simulation.
- **STRENGTHS:**
 - ▲ Plays a range of battlespace missions in a wide variety of terrain settings.
 - ▲ Real strengths lie in its portrayal of urban terrain operations and in its portrayal of non-lethal weapons.
- **LIMITATIONS:** Scalability upwards. Not Verified and Validated for Analytical or Experimentation uses.
- **APPLICATION:** JCATS is the perfect tool for the Non-Kinetic LOE. It plays all forms of non-kinetic weapons and there is already available Kosovo terrain and scenario data bases.



JSAF (Joint Semi-Automated Forces) (STO)

Joint Experimentation



- **JSAF is the simulation piece of the STOW ACTD and its control center is resident within the JTASC.**

- **STRENGTHS:**

- ▲ **Excellent HITL capability.**
- ▲ **High resolution facilitates examination of specific systems/parameters.**
- ▲ **Already performed VVA leading up to J9901 event.**

- **LIMITATIONS:**

- ▲ **High operating overhead - personnel/equipment.**
- ▲ **Limited scalability upwards**



- **DOE-LANL simulation** that represents the next generation of M&S technologies and is designed to take advantage of the supercomputing power of the lab.
- **STRENGTHS**: Can model upwards of 2.5M entities. Used to analyze the traffic problems in Dallas and Los Angeles. Use of this simulation allows JFCOM to “buy into” M&S future technology and assess it for use in other areas of combat simulation.
- **LIMITATIONS**: Will need to adapt this for military context.



JWARS (Joint WARfare System)

Joint Experimentation



- **JWARS is a Joint Staff J8-sponsored program currently under development as an analytical tool to support joint analysis and the QDR.**
- **STRENGTHS:**
 - △ **A joint, fast-running simulation.**
 - △ **Robust, balanced representation of warfare functionality.**
 - △ **Designed from the ground up as an analytical tool with concurrent V&V.**
- **LIMITATIONS: A limited version will be released next spring. Unknown.**
- **APPLICATION: J9 will use this tool to shadow the Pegasus work and to learn evaluate its'**



EADTB (Extended Air Defense Test Bed)

Joint Experimentation



- **Space and Missile Defense Battle Lab-owned, high-resolution simulation of the full spectrum of Joint battlefield sensors and resultant weapon performance against fixed, mobile, and airborne targets.**
- **STRENGTHS:**
 - ▲ **Good options for varying levels of detail across all battlefield elements.**
 - ▲ **Flexibility in specific system representation allows balancing of scope, fidelity, and execution speed.**
 - ▲ **Multi-resolution terrain and features, and weather.**
 - ▲ **High resolution.**
- **LIMITATIONS:**
 - ▲ **More air-oriented than others.**
 - ▲ **Limited Battlespace.**
- **APPLICATION: Use to support AOACMT special issues**



Pegasus



Joint Experimentation

- **DMSO-sponsored HLA federation demonstration project linking nominated Service models - Eagle, NSS, and EADSIM.**
- **STRENGTHS:**
 - ▲ **Runs faster than real time.**
 - ▲ **Federation development process facilitates linking the best models for a specific event quickly.**
 - ▲ **Strong suite of data collection and analysis tools.**
 - ▲ **Sims were nominated by the service components to specifically address JSEAD issues.**
- **LIMITATIONS:**
 - ▲ **Limited capability to explore HITL issues.**
- **APPLICATION: Use to conduct RDO/AOACMT event J0019.**



Joint Experimentation

